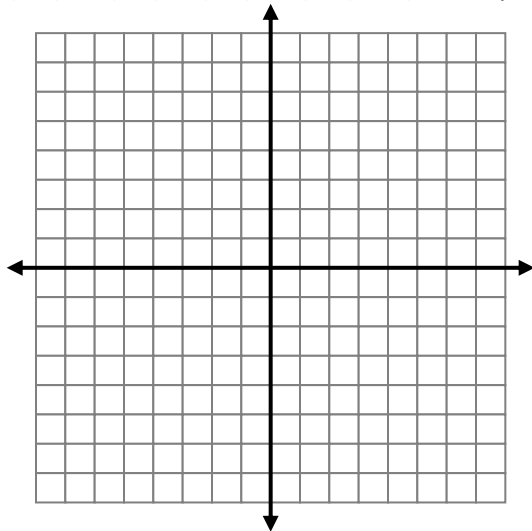


Decide whether you are given enough information to determine that the quadrilateral is a parallelogram.

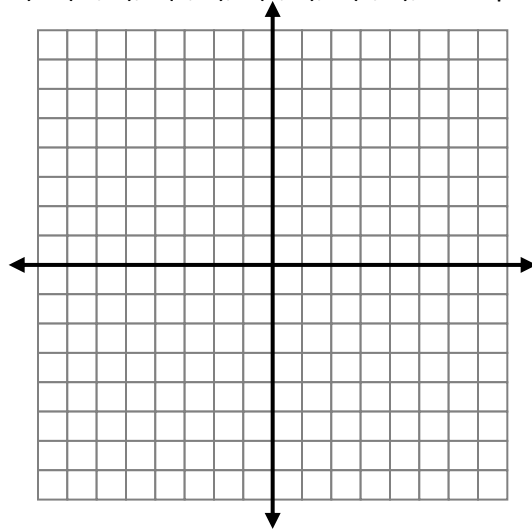
- | | |
|--|---|
| 1) Opposite sides are parallel. | 2) Opposite sides are congruent |
| 3) Two pairs of consecutive sides are congruent. | 4) Two pairs of consecutive angles are congruent. |
| 5) Diagonals are congruent. | 6) Diagonals bisect each other. |
| 7) All four sides are congruent. | 8) Consecutive angles are supplementary. |

Prove that the points represent the vertices of a parallelogram. Use the method indicated.

- 9) $A(-4, 7)$, $B(3, 0)$, $C(2, -5)$, $D(-5, 2)$; Both pairs of opposite sides are parallel.

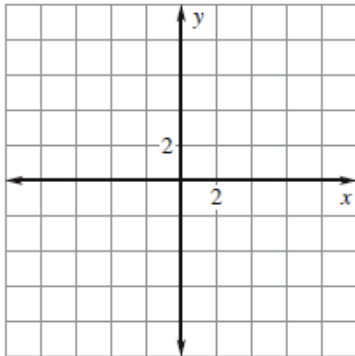


- 10) $A(-2, 8)$, $B(2, 7)$, $C(5, 1)$, $D(1, 2)$; Both pairs of opposite sides are congruent.

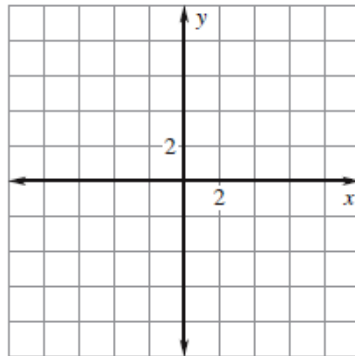


Find all possible coordinates for the fourth vertex of a parallelogram with the given vertices. Then draw the parallelogram on the graph.

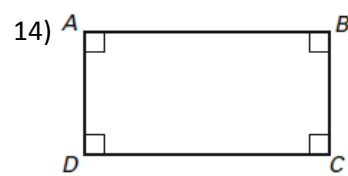
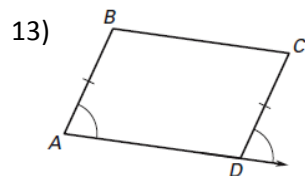
11) (4, -1), (-4, 1), (0, 8)



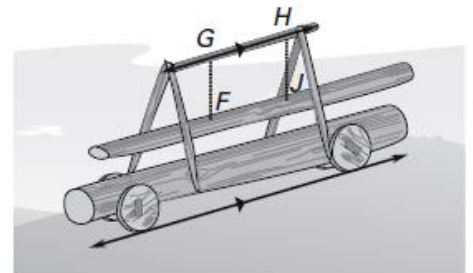
12) (3, -4), (-2, -1), (1, 2)



Describe how to prove that $ABCD$ is a parallelogram.



15) The diagram shows a battering ram which was used in ancient times to break through walls. A log is suspended on ropes of equal length (\overline{GF} and \overline{HJ}). The log swings, causing quadrilateral $FGHJ$ to shift. In the diagram, $\overline{GH} \cong \overline{FJ}$, and \overline{GH} is parallel to the ground.



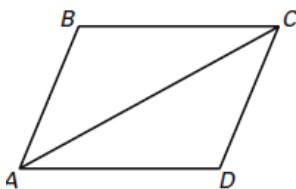
a) Identify $FGHJ$. Explain.

b) Explain why the log is always parallel to the ground.

16) Complete the following proof.

Given: $\triangle ABC \cong \triangle CDA$

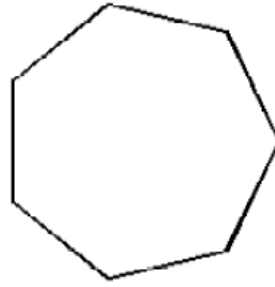
Prove: $ABCD$ is a parallelogram.



Statements	Reasons
1. $\triangle ABC \cong \triangle CDA$	1.
2. $\overline{AB} \cong$ _____ $\overline{BC} \cong$ _____	2.
3. $ABCD$ is a parallelogram	3.

17) How many triangles are formed by drawing diagonals from one vertex in the figure? Find the sum of the measures of the interior angles in the figure.

- A) 5, 900°
- B) 5, 1080°
- C) 6, 900°
- D) 6, 1080°



18) The sum of the measures of the interior angles of a convex quadrilateral is _____.

- A) 180°
- B) 270°
- C) 360°
- D) 540°

19) The measure of each interior angle of a regular hexagon is _____.

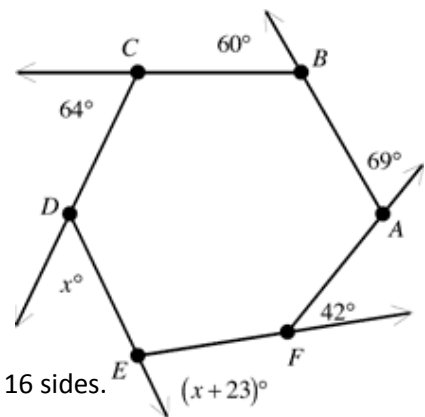
- A) 30°
- B) 120°
- C) 15°
- D) 60°

20) The measure of each exterior angle of a regular octagon is _____.

- A) 22.5°
- B) 67.5°
- C) 45°
- D) 135°
- E)

21) Find the value of x . (The figure may not be drawn to scale.)

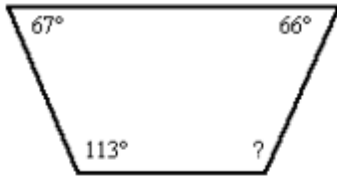
- A) 74
- B) 108
- C) 49
- D) 51



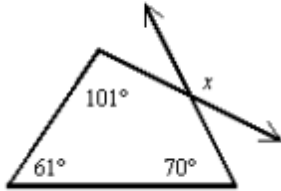
22) Find the measure of each exterior angle of a regular polygon with 16 sides.

- A) 11.25°
- B) 360°
- C) 22.5°
- D) 157.5°

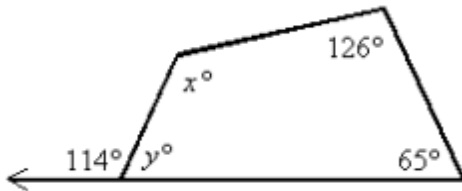
23) Find the measure of the missing angle.



24) Find the value of x .



25) Find the values of x and y .



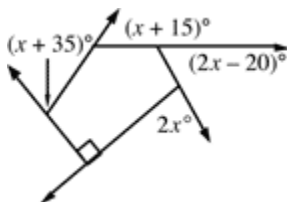
26) Find the number of sides of a convex polygon if the measures of its interior angles have a sum of 2880° .

27) Find the number of sides of a regular polygon with each interior angle equal to 171° .

28) Find the measure of an interior angle and an exterior angle of a regular polygon with 20 sides.

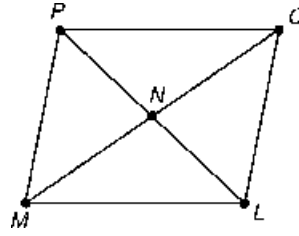
29) Find the measure of an interior angle and the measure of an exterior angle for a regular 32-gon.

30) Find each exterior angle measure in the diagram below



31) For parallelogram $PQLM$, if $m\angle PML = 83^\circ$, then $m\angle PQL =$ _____.

- A) $m\angle PQM$
- B) 83°
- C) 97°
- D) $m\angle QLM$



32) Consecutive angles in a parallelogram are always _____.

- A) Congruent angles
- B) Complementary angles
- C) Supplementary angles
- D) Vertical angles

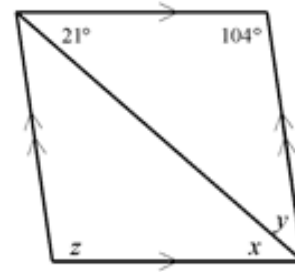
33) Choose the statement that is NOT ALWAYS true.

For any parallelogram _____.

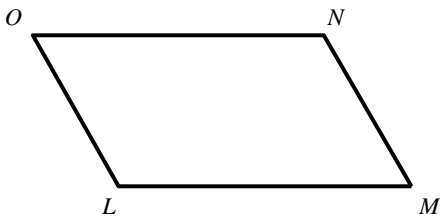
- A) The diagonals bisect each other
- B) Opposite sides are congruent
- C) The diagonals are perpendicular
- D) Opposite sides are congruent

34) Find the value of the variables in the parallelogram.

- A) $x = 52^\circ, y = 10.5^\circ, z = 159^\circ$
- B) $x = 21^\circ, y = 55^\circ, z = 104^\circ$
- C) $x = 55^\circ, y = 21^\circ, z = 104^\circ$
- D) $x = 10.5^\circ, y = 52^\circ, z = 159^\circ$

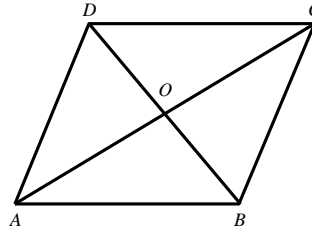


35) If $ON = x^2$, $LM = 3x + 10$, $NM = x + 4$, and $OL = 3y + 3$, find the values of x and y given that $LMNO$ is a parallelogram.

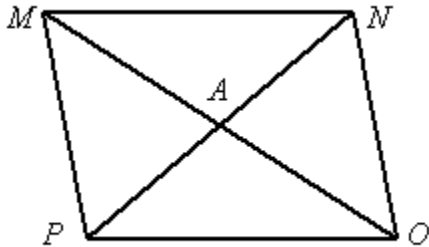


36) Complete the statement for parallelogram $ABCD$. Justify your answer.

$\overline{AD} \cong \underline{\hspace{2cm}}$



37) Find AM in the parallelogram if $PN = 10$ and $MO = 19$.



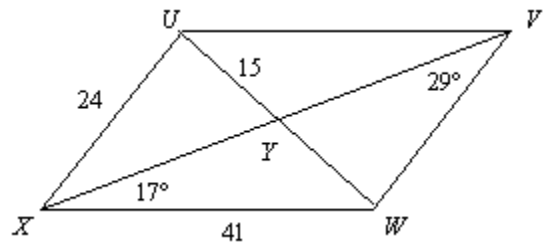
38) $UVWX$ is a parallelogram, $m\angle WXV = 17^\circ$, $m\angle WVX = 29^\circ$, $XW = 41$, $UX = 24$, $UY = 15$

a) Find $m\angle WVU$.

b) Find WV .

c) Find $m\angle XUV$.

d) Find UW .



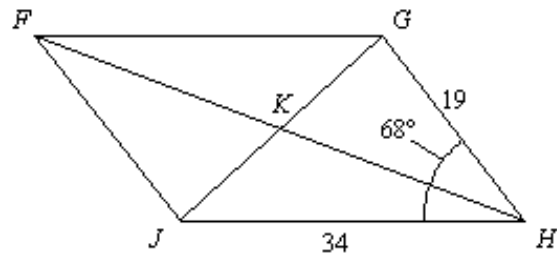
39) $FGHJ$ is a parallelogram, $m\angle JHG = 68^\circ$, $JH = 34$, $GH = 19$

a) Find $m\angle FJH$.

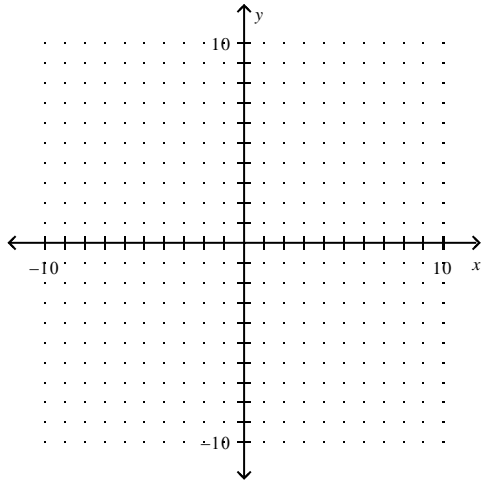
b) Find JF .

c) Find $m\angle GFJ$.

d) Find FG .

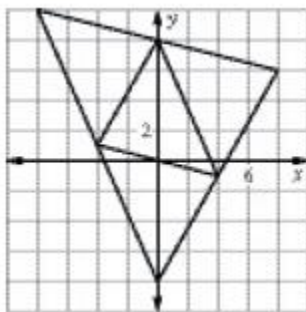


- 40) Find a fourth point, D , so that a parallelogram is formed using the vertices $A(0, -4)$, $B(5, -3)$, $C(-4, -3)$, and D in any order. Plot your point and draw the parallelogram in the coordinate plane.

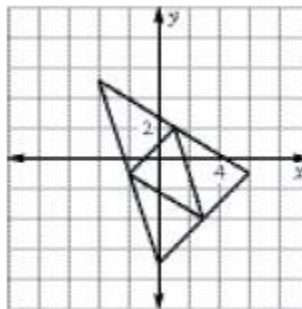


Answer Key

- 1) Yes
- 2) Yes
- 3) No
- 4) No
- 5) No
- 6) Yes
- 7) Yes
- 8) Yes
- 9) Slope of $\overline{AB} = \text{slope of } \overline{CD} = -1$;
Slope of $\overline{BC} = \text{slope of } \overline{DA} = 5$,
Since both pairs of opposite sides are parallel, $ABCD$ is a parallelogram.
- 10) $AB = CD = \sqrt{17}$;
 $BC = DA = 3\sqrt{5}$.
Since both pairs of opposite sides are congruent, $ABCD$ is a parallelogram.
- 11) $(8, 6)$, $(0, -8)$, and $(-8, 10)$



- 12) $(6, -1)$, $(0, -7)$ and $(-4, 5)$



- 13) $\overline{AB} \parallel \overline{CD}$ by Corr. Angles Converse. Since one pair of opposite sides is both parallel and congruent, $ABCD$ is a parallelogram.
- 14) Since both pairs of opposite angles are congruent, $ABCD$ is a parallelogram.
- 15) a) $\overline{GF} \cong \overline{HJ}$ and $\overline{GH} \cong \overline{FJ}$, so $FGHJ$ is a parallelogram since both pairs of opposite sides are congruent.
b) $FGHJ$ is always a \sphericalangle , so $\overline{GH} \parallel \overline{FJ}$. Because \overline{GH} is parallel to the ground, then \overline{FJ} is also parallel to the ground. The moving log is always parallel to the ground.

- 16) Given; \overline{CD} ; \overline{AD} ; CPCTC; In a quadrilateral, if both pair of opp. Sides are congruent, then it is a parallelogram.

- 17) A
- 18) C
- 19) B
- 20) C
- 21) D
- 22) C
- 23) 114°
- 24) 128°
- 25) $X=103$, $y = 66$
- 26) 18
- 27) 40
- 28) Int angle: 162° , ext angle: 18°
- 29) $\approx 168.8^\circ$, $\approx 11.2^\circ$
- 30) 55° , 60° , 75° , 80°
- 31) B
- 32) C
- 33) C
- 34) B
- 35) $X = -2$ or 5 , $y = -1/3$ or 2
- 36) \overline{BC} , opp. Sides of parallelogram are congruent
- 37) 9.5
- 38) a) 46° b) 24 c) 134° d) 30
- 39) a) 112° b) 19 c) 68° d) 34
- 40) $(1, -2)$, $(9, -4)$, or $(-9, -4)$